



COMMONWEALTH of VIRGINIA


DEPARTMENT OF TRANSPORTATION
1601 ORANGE ROAD
CULPEPER, VA 22701-3819

PHILIP A. SHUCET
COMMISSIONER

DONALD R. ASKEW
DISTRICT ADMINISTRATOR

MEMORANDUM

TO: Residency Engineers, Assist Residency Engineers, Project Managers and Site Reviewers

FROM: Jim Filson, District Drainage Engineer 

DATE: November 4, 2002

SUBJECT: Video Camera Inspection of Storm Sewer and Culverts Prior to Acceptance into VDOT Systems

This memorandum is an update and replaces the February 11, 2002 memorandum entitled, "Video Camera Inspection for Storm Sewer/Culverts using High-Density Polyethylene (HDPE) Pipe." VDOT Central Office is working on a new Instructional and Informational Memorandum (IIM) to require the videotaping of all allowable pipe types (per IIM 121.14) that will be accepted into VDOT's maintenance program and ownership.

VDOT Culpeper District is requiring video camera inspections, at the cost to the contractor, of any pipe system or culvert that are deemed inaccessible to VDOT inspectors prior to acceptance into VDOT's maintenance program and ownership. The Residency will be responsible for reviewing the submitted videos and provide documentation of the deficiencies to the Developer/Builder/Owner. All deficiencies will be noted on the inspection report and corrected or waived before acceptance is granted. Residencies are responsible for maintenance of all structures and pipes accepted into the VDOT Maintenance Program, therefore will be responsible for the decision to waive a deficiency and to maintain records of all deficiencies.

Attached are procedures and requirements for the video and documentation of the Video Inspections until the above mentioned IIM is approved. The Culpeper District will require the following note(s) to be placed on all subdivision plans.

1. All plans should include the following note if any allowable pipe or pipe system per IIM 121.14 is proposed.

"A video camera inspection is required for all storm sewers and culverts that are deemed inaccessible to VDOT inspections. The video camera inspection shall be made with a VDOT and/or County inspector present."

2. All plans should include the following note if high-density polyethylene (HDPE) pipe or pipe system is proposed.

"The contractor and a representative from the pipe manufacturer should hold an on-site pre-construction meeting for installation training. The pipe manufacturer should spend a minimum of two hours on the job site during initial installation."

This is effective immediately for all pipes or pipe systems that have not been accepted by VDOT. If there are any questions, please do not hesitate to notify me.

Video Camera Inspection Storm Sewers and Culverts

SCOPE

For projects that are constructed without VDOT inspection and are proposed to be accepted in to the highway system, a video camera inspection is required for all storm sewers and for culverts that are deemed inaccessible to VDOT Inspectors. The video camera inspection is to be made with a VDOT Inspector present.

The video camera is to have fully articulating lenses that will provide a 360 degree inspection of each joint and any deficient areas of the pipe. A video tape copy of the inspection is to be provided to the VDOT Inspector upon completion of the inspection.

PROCEDURES

Deficiencies shall be noted on the inspection report with their corresponding location on the project site and the distance from the inspection access point. If no deficiencies are noted or the deficiencies are not deemed by the VDOT Inspector as detrimental to the drainage system, an OK entry shall be made in the report under the remarks column for each section of pipe inspected.

Where deficiencies are located, video recording is to be used to note the deficiency in addition to the report form. The location and description of the deficiency should be added to the recording by the use of an audio microphone.

When deficiencies are noted that are deemed by the VDOT Inspector to require corrective actions, the suggested method of correcting the deficiency shall be noted both on the recording and the report form.

Upon completion of the corrective measures, the deficient locations are to be re-inspected by these same test methods.

DEFICIENCIES

Deficiencies may include the following and other problems that are deemed by the VDOT Inspector as deficiencies:

1. Crushed, collapsed or deformed pipe or joints.
2. Sags in the longitudinal profile that can be evidenced by ponded water.
3. Improper joints that can allow leaking or infiltration of backfill.
4. Misaligned joints that can cause debris accumulation.
5. Pipe that has been penetrated by guardrail or other posts or improper backfill materials or methods.
6. Debris, construction or other materials in the pipe or structures.

REPORTS

The attached form is to be used to report the inspection findings.

Video Camera

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Camera Owner

[illegible]

VIRGINIA DEPARTMENT OF TRANSPORTATION

LOCATION AND DESIGN DIVISION

INSTRUCTIONAL AND INFORMATIONAL MEMORANDUM

GENERAL SUBJECT: ALLOWABLE PIPE CRITERIA FOR CULVERTS AND STORM SEWERS	NUMBER: LD-01 (D) 121.14
SPECIFIC SUBJECT: DRAINAGE STRUCTURE CRITERIA (Supplement to VDOT'S <u>Drainage Manual</u>)	DATE: APRIL 5, 2001
	SUPERSEDES: LD-97 (D) 121.13
DIVISION ADMINISTRATOR APPROVAL: <i>C. F. Boles, III</i> Acting Location and Design Engineer	

Changes are shaded.

EFFECTIVE DATE

- This memorandum is effective upon receipt for all projects within the drainage design phase of plan development up to the first submission to the Construction Division for project advertisement. For projects that are past the first submission stage, revisions in the drainage design should not be made if only for the purpose of complying with this memorandum, but revisions should be made if significant plan revisions are needed for other reasons. The intent is to not delay plan development or project construction for the sole purpose of complying with this memorandum.

CURRENT REVISION

- TABLE A – Allowable Types of Pipe Culvert. Revisions were made to allowable materials. Shading has been omitted on this table.
- TABLE A1 – Added table for Storm Sewer Pipe. Revisions were made to allowable materials. Shading has been omitted on this table.
- Drainage instructions have been removed from this memorandum and are now in new IIM LD-01 (D) 223.
- Pipe Bedding and Backfill instructions have been removed from this memorandum and are now in new IIM LD-01 (D) 225.

TABLE A – ALLOWABLE TYPES OF PIPE CULVERT
(For roadways that are constructed, funded or will ultimately be maintained by VDOT)

FUNCTIONAL CLASSIFICATION OF ROAD SYSTEM UNDER WHICH PIPE IS TO BE INSTALLED					ENTRANCE PIPE
Rural Principal Arterial, Urban Principal Arterial, Rural Minor Arterial, Urban Minor Arterial, Rural Collector Roads, Urban Collector Streets, Subdivision Streets (>4000 ADT)			Rural Local Roads, Urban Local Streets, Subdivision Streets (<4000ADT)		
*ALLOWABLE PIPE CULVERTS	Statewide Except Locations Shown in Table B	Locations Shown In Table B	Statewide Except Those Locations Shown in Table B	Locations Shown In Table B	
Concrete	✓	✓	✓	✓	✓
Aluminum Coated Type 2 Corrugated Steel Notes: 1, 2 and 3	✓		✓		✓
Aluminum Coated Type 2 Corrugated Steel Fully Asphalt Coated Notes: 1, 2 and 3	✓		✓	✓	✓
Galvanized Corrugated Steel Fully Asphalt Coated With Paved Invert Notes: 1, 2 and 4	✓		✓	✓	✓
Galvanized Steel Structural Plate Fully Asphalt Coated With Paved Invert Notes: 1, 2, 4 and 7	✓		✓	✓	✓
Galvanized Steel Structural Plate Fully Asphalt Coated Notes: 1, 2, 4 and 7			✓		✓
Polymer Coated (10/10) Corrugated Steel Notes: 1, 2 and 5	✓	✓	✓	✓	✓
Uncoated Galvanized Corrugated Steel Notes: 1, 2, 4 and 7			✓		✓
Corrugated Aluminum Alloy Culverts & Structural Plate Notes: 1, 2 and 6	✓	✓	✓	✓	✓
PVC (Polyvinylchloride) Storm Drain Pipe (Smooth Interior) Note: 1	✓	✓	✓	✓	✓
Polyethylene Double Wall Type S and Type D Note: 1	✓	✓	✓	✓	✓
Polyethylene Corrugated Type C Note: 1	✓	✓	✓	✓	

* See Standard PC-1 for height of cover limitations for each type of pipe.

TABLE A1 – ALLOWABLE TYPES OF STORM SEWER PIPE
(For roadways that are constructed, funded or will ultimately be maintained by VDOT)

FUNCTIONAL CLASSIFICATION OF ROAD SYSTEM UNDER WHICH PIPE IS TO BE INSTALLED				
Rural Principal Arterial, Urban Principal Arterial, Rural Minor Arterial, Urban Minor Arterial, Rural Collector Roads, Urban Collector Streets, Subdivision Streets (>4000 ADT)			Rural Local Roads, Urban Local Streets, Subdivision Streets (<4000 ADT)	
* ALLOWABLE PIPE	Statewide		Statewide Except Locations Shown In Table B	Locations Shown In Table B
Concrete	✓		✓	✓
PVC (Polyvinylchloride) Corrugated Storm Drain Pipe (Smooth Interior) Note: 1			✓	✓
Polyethylene Double Wall Type S and Type D Note: 1			✓	✓
Aluminum Smooth Wall Spiral Rib Notes: 1, 2 and 6			✓	✓
Aluminum Coated Type 2 Steel Smooth Wall Spiral Rib Notes: 1, 2 and 3			✓	
Aluminum Coated Type 2 Steel Smooth Wall Spiral Rib Asphalt Coated Notes: 1, 2 and 3			✓	
Corrugated Steel Aluminum Coated Type 2 Fully Concrete Lined Notes: 1, 2 and 3			✓	
Corrugated Steel Aluminum Coated Type 2 Fully Asphalt Coated & Fully Paved Notes: 1, 2 and 3			✓	
Galvanized Corrugated Steel Fully Asphalt Coated & Fully Concrete Lined Notes: 1, 2 and 4			✓	
Galvanized Corrugated Steel Fully Asphalt Coated & Fully Paved Notes: 1, 2 & 4			✓	

* See Standard PC-1 for height of cover limitations for each type of pipe.

NOTES FOR:

TABLE A – CULVERTS
&
TABLE A1 – STORM SEWERS

The use of pipe material specified in Table A or Table A1 will not be permitted if:

1. The height of cover is less than the minimum shown in VDOT's current Road and Bridge Standards OR the height of FILL (not cover) EXCEEDS 20' (6.1 m) (unless an exception is granted by the State Location and Design Administrator.)
2. The design velocity exceeds 10 fps (3 mps) when an abrasive bedload is present or anticipated.
3. The pH of the soil OR water is less than 5.0 or greater than 9.0 OR the Resistivity is less than 1500 Ohm-Cm.
4. The pH of the soil OR water is less than 6.0 or greater than 8.0 OR the Resistivity is less than 2500 Ohm-Cm.
5. The pH of the soil OR water is less than 3.0 or greater than 12.0 OR the Resistivity is less than 500 Ohm-Cm.
6. The pH of the soil OR water is less than 4.0 or greater than 9.0 OR the Resistivity is less than 500 Ohm-Cm.
7. In locations where the Resistivity exceeds 7,000 Ohm-Cm (common to soft water conditions), the culvert must have a paved invert.

Locations that require a pH and Resistivity analysis as well as an evaluation of the abrasive bedload potential should be noted on the plans that are used to request culvert foundation information from the Materials Division. The pH and Resistivity Analysis of the soil and water are to be requested for each culvert location allowing a metal culvert where any of the following conditions exist:

- 1) 36" (or equivalent) or larger culvert OR
- 2) Live stream OR
- 3) Areas of known premature pipe failure

In areas of known premature pipe failure the pH and Resistivity Analysis is to be requested for any type of proposed pipe material.

The following note is to be included in the General Notes under "Drainage" for all projects that have locations that do not allow the use of uncoated Galvanized Corrugated Steel Pipe. If Galvanized Structural Plate is required or allowed as an option:

D-4 In locations where Galvanized Steel Pipe is allowed that require a paved invert, the paved invert shall be a factory applied asphalt paving or a field applied concrete invert. As an option, the plates along the bottom 25% (minimum) of the circumference of the Galvanized Structural Plate Steel Pipe or the bottom and corner plates of the Galvanized Structural Steel Pipe Arch shall be a minimum of two sheet thickness (gage) heavier than the sheet thickness (gage) indicated in the applicable VDOT Road and Bridge Standard PC-1 for applicable cover.

Example: For a pipe with cover requiring D 109" sheet thickness (12 gage) plates, the bottom plates shall be D 168" sheet thickness (8 gage). The sheet thickness (gage) of the remainder of the pipe plates shall either conform to Standard PC-1 or to the heavier plates used in the bottom of the pipe.

Any deviation from criteria shown in TABLE A OR TABLE A1 (such as a more restrictive use of pipe types) must be approved by the State Location and Design Administrator.

Shoulder Slot Inlets – Any of the corrugated pipes listed in TABLE A for a specific roadway classification and location may be used with shoulder slot inlets.

TABLE B
EXCEPTIONS TO STATEWIDE APPLICATION

<u>Counties (including towns)</u>	<u>Cities</u>
Arlington -East of and including Rtes. 95 & 395	Suffolk-East of and including Rte. 32
Fairfax -East of and including Rtes. 95 & 395	Chesapeake
Prince Wm. -East of and including Rtes. 95 & 395	Virginia Beach
Stafford -East of and including Rtes. 95 & 395	Hampton
Surry -East of and including Rte. 10	Newport News
Isle of Wight -East of and including Rte. 10 King George	Norfolk
Westmoreland	Alexandria
Lancaster	Fredericksburg
Matthews	Williamsburg
Gloucester	Poquoson
James City	Portsmouth
Accomack	
Northumberland	
Essex	
Middlesex	
York	
Richmond	
Northampton	

TABLE C

An Allowable Pipe Types Summary (see example below) is to be shown at the end of the Drainage Summary.

Tabulation will vary with classification of roadway and location within State. Numerous combinations of pipe types may be used on a particular subject.

The base for the following table can be found in the CADD DYSM Cell Library.

EXAMPLE

ALLOWABLE PIPE TYPES (UNLESS OTHERWISE SHOWN ON PLANS) (SEE STANDARD DRAWING PC-1 FOR HEIGHT OF COVER LIMITATIONS FOR EACH TYPE)											
LOCATION (YORK CO.)	CONCRETE	GALVANIZED CORRUGATED STEEL FULLY ASPHALT COATED WITH PAVED INVERT	UNCOATED GALVANIZED CORRUGATED STEEL	CORRUGATED ALUMINUM ALLOY	POLYETHYLENE CORRUGATED TYPE C	POLYETHYLENE DOUBLE- WALL TYPE S AND TYPE D	ALUMINUM COATED TYPE 2 CORRUGATED STEEL	ALUMINUM COATED TYPE 2 CORRUGATED STEEL FULLY ASPHALT COATED	POLYVINYLCHLORIDE (PVC) CORRUGATED STORM DRAIN PIPE (SMOOTH INTERIOR)	ALUMINUM SMOOTH WALL SPIRAL RIB PIPE	POLYMER COATED (10/10) CORRUGATED STEEL
Rte. 64 & Ramps	X			X	X	X			X		X
Route 635 (Rural Local Road)	X	X		X	X	X		X	X		X
Storm Drain Systems Main Roadway & Ramps	X										
Storm Drain Systems Route 635	X					X			X	X	
Entrances	X	X	X	X		X	X	X	X		X
Shoulder Slot Inlet		X	X	X	X		X	X	X		X

It will be necessary to formulate a tabulation to specifically fit each project based upon the roadway classification and location.

TABLE D

MANNING ROUGHNESS COEFFICIENT (n)

The roughness coefficient for each pipe material represents the value determined by laboratory tests with an adjustment factor to compensate for the additional losses experienced in actual field installations. Values may be higher for installations that show deterioration.

<u>MATERIAL</u>	<u>ROUGHNESS COEFFICIENT (n)</u>
Concrete Pipe	0.013
PVC (Polyvinylchloride) Storm Drain Pipe (Smooth Interior)	0.011
Polyethelene Double Wall (Type S and Type D) (Smooth Interior)	0.012
Steel or Aluminum Spiral Rib Pipe	0.014
Corrugated Steel Pipe Fully Asphalt Coated and Fully Paved	0.013
Corrugated Steel Pipe Fully Asphalt Coated and Fully Concrete Lined	0.013
Corrugated Pipe	0.024+_*
Structural Plate Pipe	0.035+_*

* Varies with size and shape of corrugations.

Storm Drains (storm sewers)

- Plans and computations submitted to the Department for review must specify the type of pipe to be used in the storm drain system and the storm drain system must be designed with the appropriate "n" value. After plans are approved, no substitution or change in the type of material will be allowed until the designer or contractor submits new plans to the Department for review. The revised design cannot be used until approved by the Department.

Stormwater Management Basins

- Culverts under or thru the dam of a Stormwater Management Basin are to be ~~concrete~~ ^{reinforced concrete} sewer pipe with rubber gaskets. Pipe Specifications: 232 (AASHTO M170), Gasket Specifications: 212 (ASTM C443).
- A concrete cradle is to be used under the pipe to prevent seepage thru the dam. ~~The concrete cradle is to extend from the riser or inlet end of the pipe for a minimum distance to a point that places the cradle under the full width of the top of the dam.~~ ^{The concrete cradle is to begin at the riser or inlet end of the pipe AND EXTEND FOR THE FULL LENGTH OF THE PIPE}
- For additional details on culverts through the dams of stormwater management basins, see IIM LD- (D) 195.

Vehicular/Pedestrian Underpass

- When a corrugated metal structure is used as a vehicular or pedestrian underpass and the structure does not convey water, an asphalt coating is not to be applied to the structure.
- The underpass structure description on the plan sheet should note: "This structure shall not be asphalt coated." This same notation should be made in the Remarks column on the Summary sheet.
- When a corrugated metal vehicular or pedestrian underpass structure is specified under a roadway classification that requires other corrugated steel pipe to be asphalt coated, the "Fully Asphalt Coated Corrugated Steel _____" box on the table of Allowable Pipe Types is to be flagged with an asterisk and the note "The underpass structure at Sta. _____ is not to be coated" is to be shown under the table.

Minimum Culvert Size Under High Fills

- A minimum 60" culvert is required for fills (not cover over pipe) that are greater than 20'. The 60" size is needed in high fills for inspection during and after construction and to facilitate future relining of the culvert where the open cut method is not usually a feasible option.